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Simulation of the ceramic products composition using furnace-waste filler

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Abstract

© Published under licence by IOP Publishing Ltd. Modern rates of construction stimulate ceramic-bricks factories to increase volume and variety of their production. At the same time, price of production should not exceed a certain limit. It can be reached by technological process optimization and with using waste of nearby industrial plants. Last time, brick factories try to use solid waste as filler. For regional production, it can be final product of coal combustion from Kazan CHP (Combined heat and power plant). The successful experience of foreign companies in furnace-waste recycling and the production of ceramic products from them, allow us to hope in acceptable results. The purpose of work was modeling composition of ceramic charge for Shelangovsk brick factory using Kazan TPP furnace-waste as filler. As experiment, to composition of clay gross products and working charge (75% clay + 15% sand + 10% buckwheat husks) of the Shelangovsk plant were added 10, 15, 20 and 25 percent of waste dopant. After molding of ceramic small brick, samples were fired at T = 980°C and then the end products were tested for strength. The results showed that addition 10, 15 and 20 percent of ash to working charge are consistently increases the strength of ceramic products in compression tests. According to the requirements of GOST (USSR Standard-Setting Authority) 530-95 for brick and ceramic stones, received products on compression match by brand not lower than M 100; by bend - not lower than M 300. The furnace-waste additive is not so effective with working natural clay. To determine specificity of reactions between waste and charge minerals was used X-ray analysis. Results are showed that ash and slag waste behaves as active fillers and forming new mineral phases. Thus, the use of ash and slag wastes of Kazan CHP as fillers for ceramic charge improves to physical and mechanical characteristics of wall bricks. At the same time, the ash-and-slag additive actively participates in mineral formation and increasing the amount of crystallization contacts in the resulting ceramic products.

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